said light transmitting film and softening said resist pattern by performing a heat treatment, thereby adjusting [the] a curvature of [the] a surface of said resist pattern.

5. (Currently Amended) A process for producing a solid-state imaging device as defined in Claim 1, [which includes etching which] wherein the etching step is carried out under the condition that said mask layer and said light transmitting film have almost the same selectivity.

REMARKS

Applicant thanks the Examiner for acknowledging receipt of Applicant's foreign priority documents that have been submitted pursuant to 35 U.S.C. §119.

Applicant also thanks the Examiner for the indication of acceptance of the previously submitted drawings. Additionally, Applicant has modified the drawings as set forth the attached drawing amendment to indicate the respective drawings are prior art in accordance with the Examiner's request.

Applicant respectfully requests reconsideration of the prior art rejections set forth by the Examiner under 35 U.S.C. §§102 and 103. Applicant respectfully submits that the prior art references of record, whether considered alone, or in combination, fail to either teach or suggest Applicant's presently claimed invention. More specifically, Applicant has modified the claims to underscore the differences between the admitted prior art and the claimed invention. Applicant's claimed invention has overcome numerous deficiencies and shortcomings of the prior art. Most notably, Applicant's new and improved imaging device is capable of achieving an improved signal to noise ratio and thus does not suffer from the same shortcomings as the prior art described in the specification and which the Examiner now uses in rejecting the claims.

As set forth in the specification and the claims, one of the most significant differences between the admitted prior art and the claims is that the allegedly anticipating prior art teaches

that etching is required in order to make the acknowledged prior art structure prior to application of the resist material which is used in forming the lens member. Actually, the cited art teaches that it is necessary to perform this intermediate etching step and thereafter apply a further light transmitting layer and mask layer. (Layer 23C) See, specifically, Figures 8C and 9A as well as the corresponding written description on pages 5-6.

Applicant has demonstrated that the cited art does not anticipate the claimed invention. Similarly, the art does not render the claimed invention obvious as there is no teaching or suggestion regarding Applicant's improved process which eliminates steps in the prior process and thus is more efficient. The alternate admitted art process does not teach or suggest the claimed process. For example, there is no teaching or suggestion of the formation of the claimed depressed region in the alternate prior art process among other significant differences. Moreover, it is important to recognize that the presently claimed invention provides unexpected improvements in the characteristics of the resultant products. See, for example, Figure 5.

Unfortunately, forming the convex lens by either of the conventional processing techniques described in the specification results in a problem that the resist thickness tends to vary as it is reduced in proportion to the pixel size. An uneven resist coating means that the thickness of the convex lens and the curvature of the lens surface vary in the same chip or in the same wafer. This results in uneven sensitivity and the level of the output signal varies from one pixel to another. See specifically, page 7 – 8.

Applicant's improved manufacturing technique and structure overcomes the shortcomings of the prior art by eliminating the requirement that etching be performed as noted in the intermediate processing of the prior art.

In light of the foregoing, Applicant respectfully submits that all of the clams now stand in condition for allowance.

Respectfully submitted,

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(Reg. #37,607)

Robert J. Depke
HOLLAND & KNIGHT LLC
131 South Dearborn Street, 30th Floor
Chicago, Illinois 60603
Tel: 312.422.9050
Fax: 312.578.6540
Attorney for Applicant

CLEAN VERSION OF CLAIMS

1. An improved process for producing a solid-state imaging device comprising the steps of: forming a light-receiving portion of a pixel in a region of a substrate, forming a convex lens with an upwardly curved surface which is embedded in an inter-layer dielectric above said light-receiving portion, and forming an on-chip lens above said convex lens, wherein said improvement comprises forming sequentially said light-receiving portion, forming an inter-layer dielectric having a depression in its surface above said light-receiving portion, forming on said inter-layer dielectric a light transmitting film having in its surface a concave portion conforming to said depression, forming at a position that covers said concave portion on said light transmitting film a mask layer with a convexly curved surface without etching or planarizing the light transmitting film, and etching said mask layer and said light transmitting film all together, thereby making said light transmitting film into a lens.

2. A process for producing a solid-state imaging device as defined in Claim 1, which further comprises, following the step of forming said light-receiving portion, the steps of forming electrodes to transfer charges generated by said light-receiving portion, said electrodes being positioned above both sides of said light-receiving portion and being insulated from said substrate, forming a shielding film which covers the charge transfer electrodes with an opening above said light-receiving portion, said shielding film being insulated from said charge transfer electrodes, and forming said inter-layer dielectric covering said shielding film and its opening in such a way that said depression is formed in the surface of said inter-layer dielectric.

3. A process for producing a solid-state imaging device as defined in Claim 1, which further comprises, following the step of forming said light-receiving portion, the step of softening said inter-layer dielectric by heat treatment, thereby adjusting a depth of said depression.

4. A process for producing a solid-state imaging device as defined in Claim 1, which further comprises the steps of forming a resist pattern as said mask layer on said light transmitting film and softening said resist pattern by performing a heat treatment, thereby adjusting a curvature of a surface of said resist pattern.

5. A process for producing a solid-state imaging device as defined in Claim 1, wherein the etching step is carried out under the condition that said mask layer and said light transmitting film have almost the same selectivity.